Nuclear Fuel Update

Palo Verde Nuclear Generating Station

March 12, 2003
Meeting with US NRC

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Review of 2002

- May 2002 Meeting with NRR
- Review of Unit 2 Cycle 11
- CENTS Implementation
- Clad Performance Strategy
- CEA Investigation
- Dry Cask Storage Update

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Agenda Today

- Reactivity Management
- CENTS & RSG/Power Uprate
- Fuel Performance
- CPC Replacement
- CEA Replacement
- Dry Cask Storage Update

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Reactivity Management

- Overview of INPO AFI
- Palo Verde Actions
- Results

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Overview

- INPO Identified
- 2001 Plant Evaluation
  - Reactivity Management AFI
    - REACTOR ENGINEERING
    - OPERATIONS

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Palo Verde Actions

- NFM/Operations/Training Interface
- Operations Single Point of Contact
- Xenon Program
- Maneuvering Box
- Procedure Enhancement
- Training

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Results

- NO REACTIVITY EVENTS
- Standardized Game Plans
- Improved Inter-Departmental Relationships
- Improved Tools

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CENTS, RSG, U2 Uprate

- CENTS Implementation Status
- U2 Power Uprate Submittal

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CENTS Implementation Status

- GL 83-11 S1 Process for 3876 MW
- U1, U2 Complete - U3 April 2003
- SABD Revision 20% Complete
- Two Events Await U2 SER
  - SGTR + LOP + SF
  - Long Term FWLB (PSV Operability)

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U2 RSG & Power Uprate

- Draft SER 3/31 -- Final SER 6/30
- SABD Supplement In Progress
- U2C12 Reload Safety Analyses Begun
- Actively Participating in Development of SG Startup Test Program

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Fuel Performance

- Integrated Fuel Clad Strategy:
  - Advanced Clad Alloys
  - Primary Chemistry
  - CRUD/Oxide Software
  - Low Duty Core Designs
- Long Range Fuel Inspection Plan

Advanced Clad Alloys

- Westinghouse Decision: Low Tin Zirlo
  - Alloy A LTA in U3C10 (Spring 2003)
- First Batches of Standard Zirlo & Columbia Fuel Rod
  - U2C11, U1C11 (2002)
  - U3C11 In April 2003
- Fuel Handling Accident Rod Pressure

Primary Chemistry

- Additional RCS Cleaning at EOC Shutdown
- Early Lithium Injection During Startups
- Elevated-Coordinated Lithium Strategy
  - Currently 7.1 pH
  - Hold Until Inconel Corrosion Issue Resolved

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CRUD/Oxide Software

- Steaming Rate in Core Design Tools
  - Screen Patterns Against U3C9 Benchmark
- APS CRUD/Oxide Model
  - Nodal Level/High Duty Ass'y Rod Level
- Vendor Fuel Duty Model
  - Safety Grade Oxide and FDI Calculations

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Low Duty Core Designs

- Increase Feed Batch Size
  - 104 vs 96 Assemblies
- Minimal Feed-Face-Feed
  - U1C10 Visuals of P1M316
- U2 Uprate Corrosion Strategy
  - Zirlo Clad
  - Re-design Lattice Pattern

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Re-Designed Lattice

- Current Lattice
  - 2 Enrichments
  - 12 High Enrichment Rods on Each Face
- New Lattice
  - 3 Enrichments
  - Same Assembly Average Enrichment
  - All Peripheral Rods Low Enrichment
- Extensive Design Review

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Long Range Fuel Inspection Plan

- Unit 2, Beginning Fall 2003
- Zirlo Oxidation (R11, R12, R13)
- Lithium 3.5 PPM (R11, R12)
- New Lattice (R12, R13)
- Assembly Bow (R11)
- Higher Burnup Leakers

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CPC Replacement

- Overview of Changes
- Licensing Schedule

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CPC Replacement Overview

- Upgrade to Modern Hardware
  - 8 CEA Calculators
- Concurrent Software Language Change
- Preserve Original Functionality & Timing
- First Installation - Fall 2003 Outage

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CPC Replacement Licensing

- SER on Westinghouse Common-Q
- Schedule for Formal RAI on PVNGS
- U2C12 Reload Engineering
  - No Impact to Safety & Uncertainty Analyses
- PVNGS Supports Joint Meeting

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CEA Replacement

- Review CEA History
- Determination of New, Conservative Lifetime
- Design of New Replacement CEAs
- Replacement of PLCEAs

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Review of CEA History

- CEA Finger Failures Observed - 2001
  - Cracks in High Fluence CEA Tips
  - Root Cause - IASCC, Inadequate Testing
  - U2/U3 With Small Pellet Less Severe
- All Full Length CEAs Replaced
  - Replaced by Design with Smallest Pellet
- Lifetime Software Abandoned

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Determination of New Lifetime

- Investigating Various Options
- Monitoring YGN Inspections
- Inconel IASCC Threshold
- Vendor Has Adjusted Software

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Design of New CEAs

- Now: Unique Feltmetal Design
- Want: Industry Standard AgInCd Tips
- Tip Region Extended 4 Inches
- Hollow AgInCd Slugs

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Replacement of PLCEAs

- Original Equipment
  - Part Length, Part Strength
  - Not Subject to Same Failure Mode
  - Reviewing Design Bases
- Replacements
  - Full Length, Part Strength
  - Transparent to Safety Analysis
  - Tech Spec Change Required

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Dry Cask Storage Update

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Dry Cask Storage Update

- Current status Unit 2
  - Loaded 24 assemblies in first canister March 3
  - Shield lid welded March 6
  - Completed first vacuum drying period March 8
  - March 10 will start 2nd vacuum drying period
- Capturing lessons learned from first loading

Fuel Loading Schedule

- Complete first canister loading in March, 2003
- Time out for Unit 3 Refueling outage, ends early May, 2003
- Complete Unit 2 campaign in June
- Load 5 casks in Unit 1 later in 2003
- Plan to load 10 casks per year

UMS Amendment 3

- Palo Verde benefits
  - Extended vacuum drying times
  - Action statements won't require submersion of Transfer Cask and Canister for cooling
  - Increased seismic limit
  - Increased PWR fuel enrichment limit
- Anticipate issuance early May 2003